

Revisit Electrolyte Chemistry of Hard Carbon in Ether for Na Storage

Jun Pan^{#†}, Yi-yang Sun[#], Yehao Yan^{||}, Lei Feng[†], Yifan Zhang[#], Aming Lin[#], Fuqiang Huang^{#§*},
Jian Yang^{†*}

#State Key Laboratory of High Performance Ceramics and Superfine Microstructure, Shanghai
Institute of Ceramics, Chinese Academy of Science, Shanghai 200050, China

†Key Laboratory of Colloid and Interface Chemistry Ministry of Education School of Chemistry
and Chemical Engineering, Shandong University, Jinan 250100, China.

||Department of Public Health, Jining Medical University, Jining 272013, China
§State Key Laboratory of Rare Earth Materials Chemistry and Applications, College of Chemistry
and Molecular Engineering, Peking University, Beijing 100871, China

1. Supplementary Figures

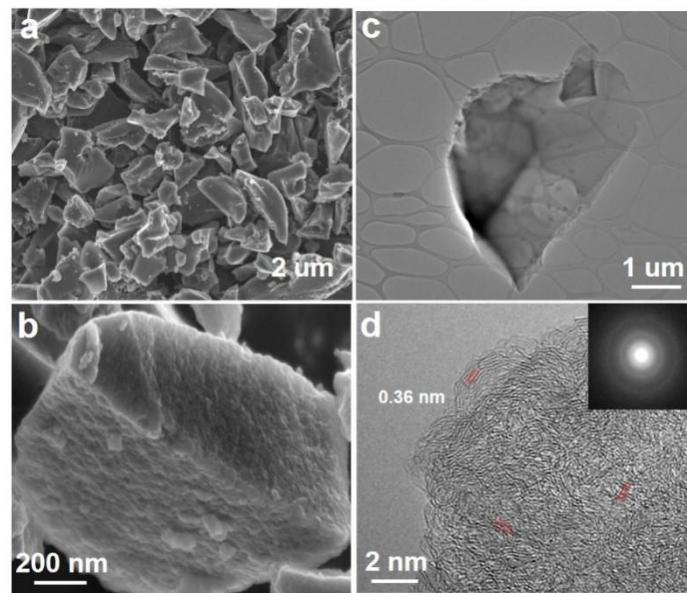


Figure S1. Morphology of hard carbon. (a, b) FESEM images, (c) TEM image, (d) HRTEM image.

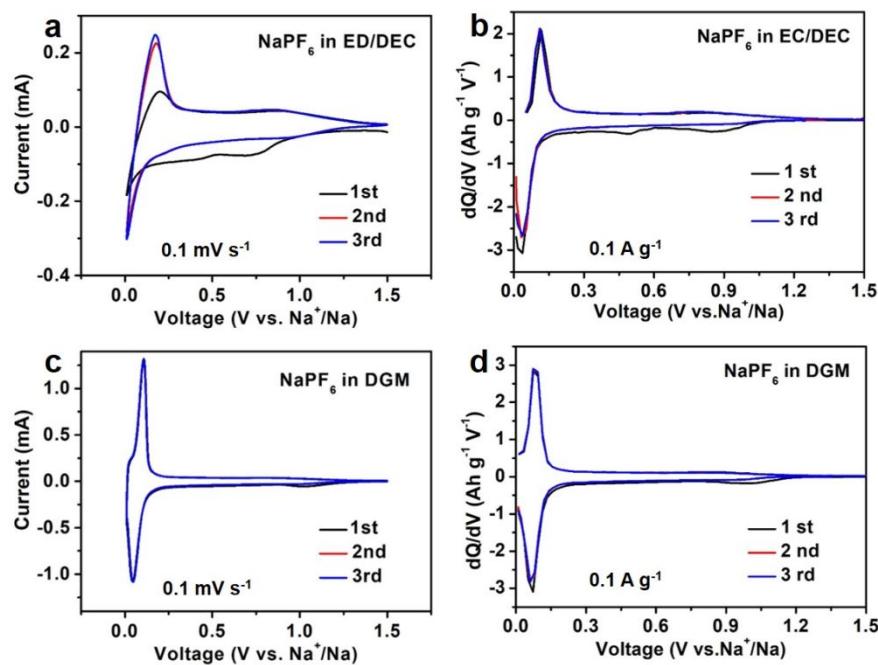


Figure S2. CV curves and dQ/dV plots of hard carbon (a, b) in EC/DEC and (c, d) in DGM.

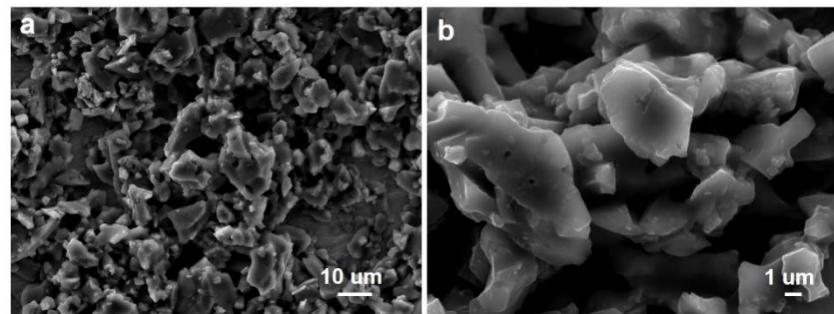


Figure S3. (a, b) *Ex-situ* SEM of hard carbon after 3500 cycles in DGM.

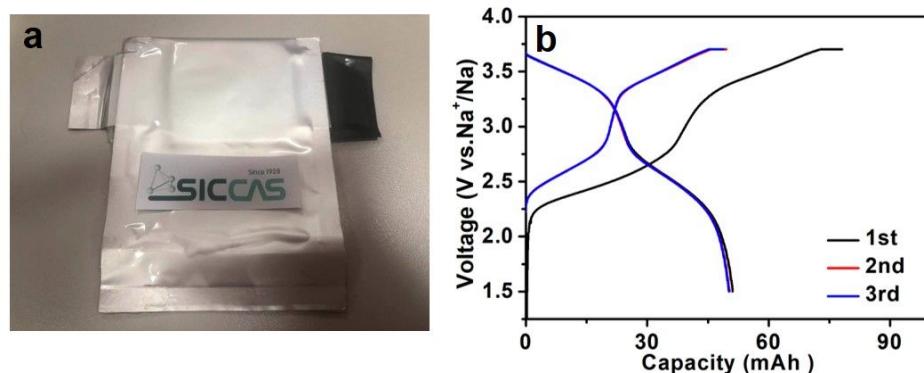


Figure S4. Pouch cell of hard carbon in DGM. (a) Picture of pouch cell. (b) Charge/discharge profiles.

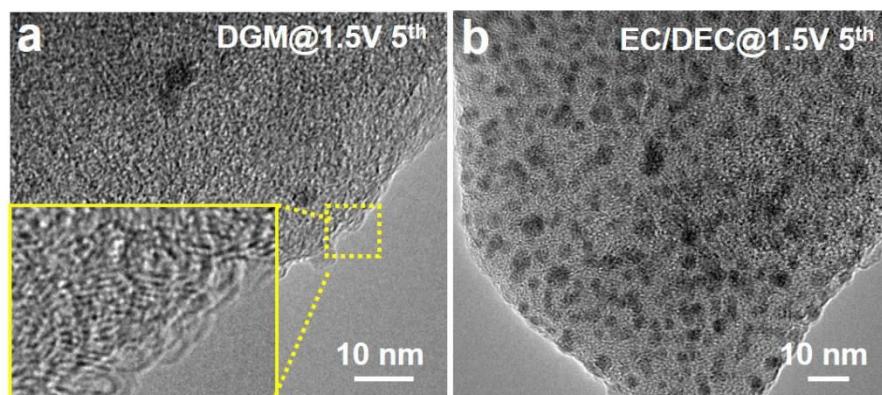


Figure S5. HRTEM images of hard carbon in DGM (a) and EC/DEC (b) at C1.5 V for the fifth cycle.

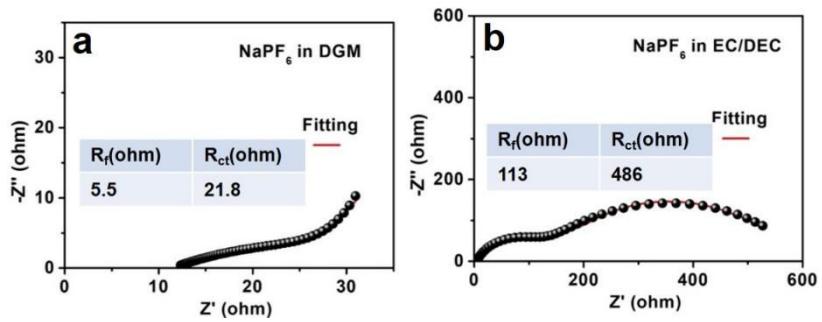


Figure S6. EIS spectra of hard carbon in DGM (a) and EC/DEC (b) at C1.5 V for the fifth cycle.

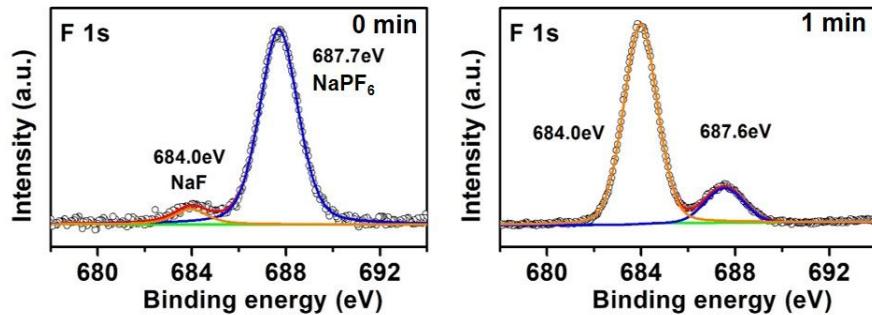


Figure S7. The F 1s spectra of the electrode at D 0.01 V in DGM before (a) and after (b) Ar-ion sputtering.

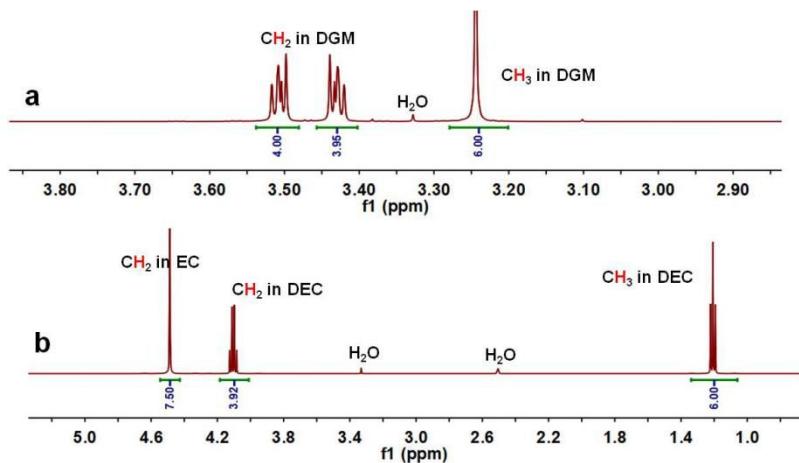


Figure S8. ^1H NMR of pure electrolytes. (a) NaPF_6 in DGM. (b) NaPF_6 in EC/DEC.

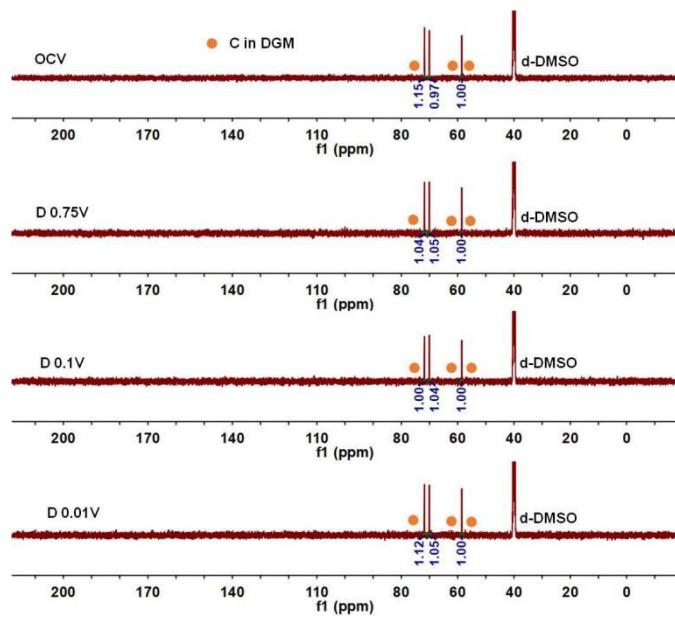
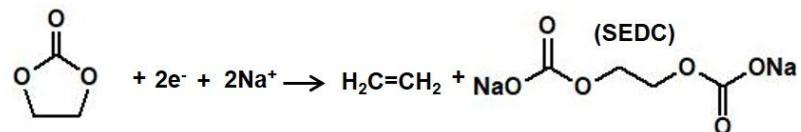


Figure S9. ^{13}C NMR of NaPF_6 in DGM.

Equation 1.



Equation 2.

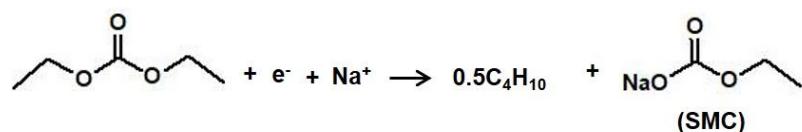


Figure S10. Equations of EC and DEC reacted with Na^+ during discharge process.

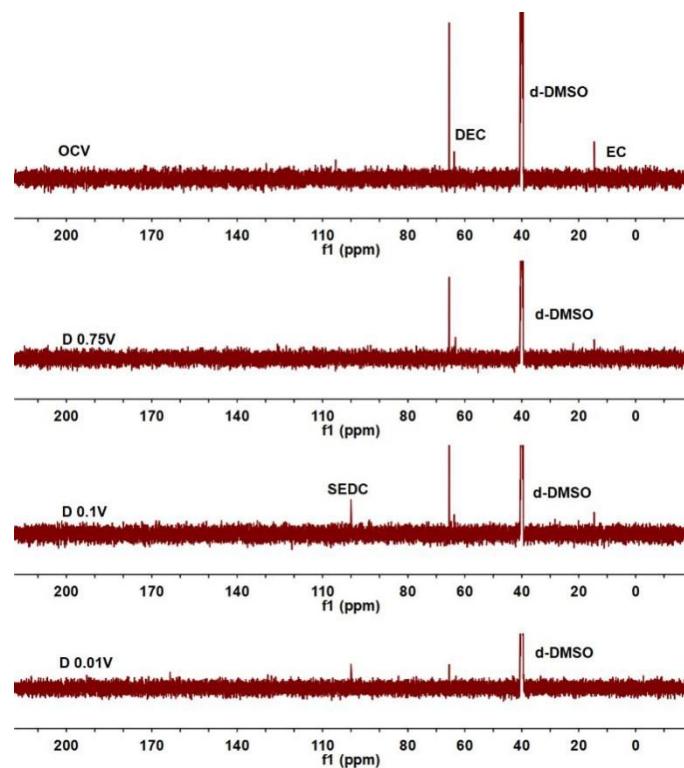


Figure S11. ^{13}C NMR of NaPF_6 in EC/DEC.

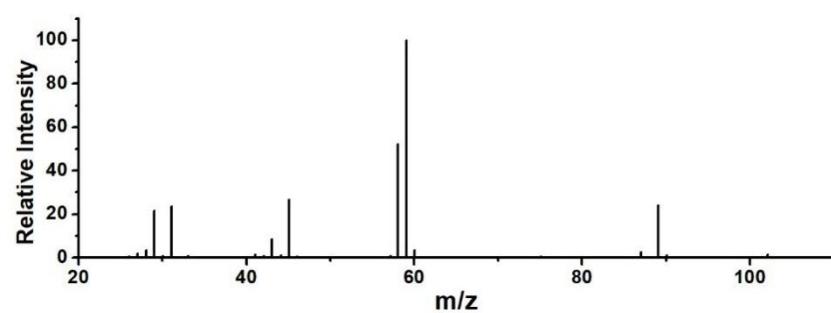


Figure S12. Standard spectrum of MS of DGM in chloroform.

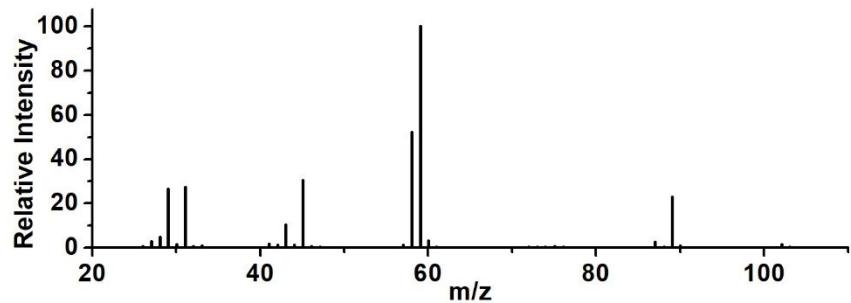


Figure S13. MS of NaPF₆ in DGM discharged to 0.01 V for the third cycle.

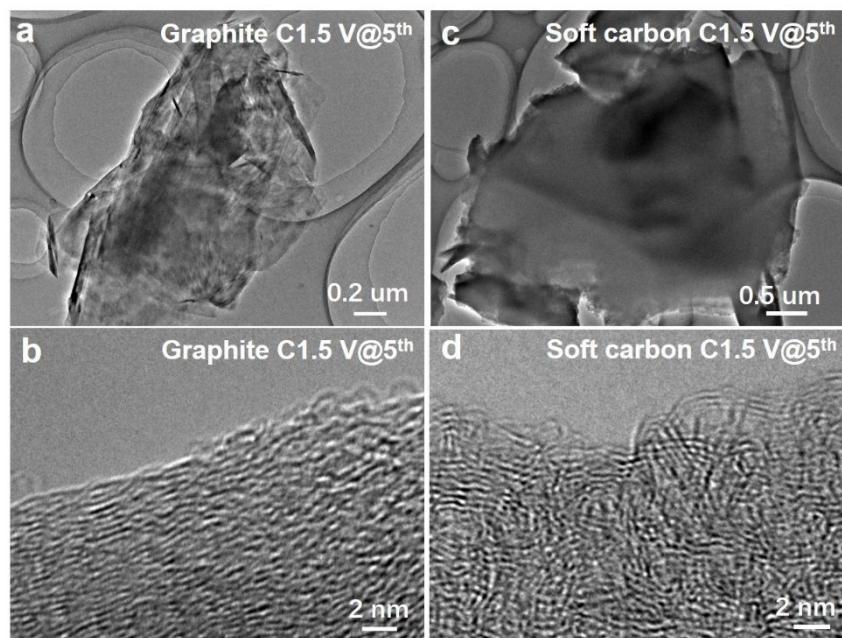


Figure S14. TEM and HRTEM images of carbon materials at C 1.5 V@5th in DGM. (a,b)

Graphite. (c,d) Soft carbon..

2. Supplementary Table

Table S1. The sodium-storage properties of reported hard carbon anodes.

Hard anode	carbon	Capacity [mA h g ⁻¹]	Cycle life	Capacity retention [%]	Ref.
LHC_opc		205 at 0.2 A g ⁻¹	500	100	1
RSS-700		143 at 0.1 A g ⁻¹	200	72	2
OPDHC-A		210 at 2.0 A g ⁻¹	3000	99	3
HCNPs		207 at 0.05 A g ⁻¹	500	77	4
LS1400		330 at 0.1 A g ⁻¹	450	91.6	5
RPC-600		135 at 0.1A g ⁻¹	1000	90	6
LJ-1300		288 at 0.1 A g ⁻¹	200	91.8	7
CPP		203 at 0.1 A g ⁻¹	200	98	8
CP		131.5 at 0.5 A g ⁻¹	500	89.8	9
SGHC-1000		136 at 1 A g ⁻¹	1000	86	10
HC		180 at 0.1 A g ⁻¹	500	95	11
HC		70 at 0.2 A g ⁻¹	1500	84	12
HC		196 at 1 A g ⁻¹	2000	90	13
HC		200 at 0.5 A g ⁻¹	1000	100	14
CEM-G-8h		140 at 0.5 A g ⁻¹	2000	98	15
S-HC		323 at 0.02 A g ⁻¹	200	98	16
HC-P15		386 at 0.02 A g ⁻¹	100	98.2	17
MV-HC		150 at 0.2 A g ⁻¹	1100	85	18
CNB		128 at 0.5 A g ⁻¹	1000	68	19
HC400-1500		300 at 0.05 A g ⁻¹	35	99	20
HC		330	50	95	21
HAT-CN		100 at 0.12 A g ⁻¹	100	95	22
Hard carbon		224.4 at 1.0 A g ⁻¹	3500	88	Ours

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